What is claimed is:

1. An illumination system, comprising:

   a light source, wherein said light source comprises at least one light-emitting diode that emits light, wherein said at least one light-emitting diode is further comprised of an emitting layer that emits said light and a reflecting layer that reflects said light, wherein the reflectivity of said reflecting layer is reflectivity $R_S$, wherein the total light-emitting area of said light source is area $A_S$ and wherein said light emitted by said light source has a maximum intrinsic source radiance;

   a light-recycling envelope, wherein said light-recycling envelope at least partially encloses said light source, wherein said light-recycling envelope has reflectivity $R_E$ and wherein said light-recycling envelope reflects and recycles part of said light back to said reflecting layer of said at least one light-emitting diode; and

   at least one light output aperture, wherein said at least one light output aperture is located in a surface of said light-recycling envelope, wherein the total light output aperture area is area $A_O$, wherein said area $A_O$ is less than said area $A_S$, wherein said light source and said light-recycling envelope direct at least a fraction of said light out of said light-recycling envelope through said at least one light output aperture and wherein said fraction of said light exits said at least one light output aperture as incoherent light having a maximum exiting radiance.

2. An illumination system as in claim 1, wherein said maximum exiting radiance is greater than said maximum intrinsic source radiance.

3. An illumination system as in claim 1, wherein said at least one light-emitting diode is chosen from the group consisting of an inorganic light-emitting diode and an organic light-emitting diode.

4. An illumination system as in claim 1, wherein said reflecting layer of said at least one light-emitting diode is located on an inside surface of said light-recycling envelope.

5. An illumination system as in claim 1, wherein said light is greater than 200 nanometers in wavelength and less than 3000 nanometers in wavelength.

6. An illumination system as in claim 5, wherein said light is ultraviolet light that is greater than 200 nanometers and less than 400 nanometers in wavelength.

7. An illumination system as in claim 5, wherein said light is infrared light that is greater than 700 nanometers and less than 3000 nanometers in wavelength.

8. An illumination system as in claim 1, wherein said light source is a plurality of light-emitting diodes that emit said light.

9. An illumination system as in claim 1, wherein said light source comprises a first light-emitting diode that emits a first light flux of a first wavelength range and a second light-emitting diode that concurrently emits a second light flux of a second wavelength range, different than said first wavelength range, and wherein a fraction of said first light flux of a first wavelength range and a fraction of said second light flux of a second wavelength range exit said at least one light output aperture as light of a composite color.

10. An illumination system as in claim 9, wherein said second light flux of a second wavelength range emitted by said second light-emitting diode is modified to change the color and the color-rendering index of said light of a composite color.

11. An illumination system as in claim 1, wherein said light source comprises a first light-emitting diode and a second light-emitting diode, wherein said first light emitting diode emits light of a first wavelength range in a first time period and a fraction of said light of a first wavelength range exits said at least one light output aperture in said first time period, wherein said second light-emitting diode emits light of a second wavelength range, different than said first wavelength range, in a second time period, different than the first time period, and a fraction of said light of a second wavelength range exits said at least one light output aperture in said second time period and wherein said first time period and said second time period are repeated to produce a light output that alternates in color.

12. An illumination system as in claim 1, wherein said reflectivity $R_S$ is at least 50%.

13. An illumination system as in claim 1, wherein said reflectivity $R_S$ is at least 70%.

14. An illumination system as in claim 1, wherein said reflectivity $R_S$ is at least 90%.

15. An illumination system as in claim 1, wherein said light source comprises a light-emitting diode and a light guide, wherein said light-emitting diode is located outside said light-recycling envelope, wherein said light guide has an input surface adjacent to said emitting layer of said light-emitting diode and an output surface located inside said light-recycling envelope, wherein said light guide transports said light from said emitting layer to said light-recycling envelope, wherein said light guide transports part of said light from said light-recycling envelope back to said reflecting layer of said light-emitting diode as recycled light and wherein said light guide transports said recycled light reflected by said reflecting layer back to said light-recycling envelope.

16. An illumination system as in claim 1, wherein said light-recycling envelope is at least partially filled with a light-transmitting solid that is in contact with at least part of the surface of said emitting layer of said light-emitting diode and wherein said light-transmitting solid improves the efficiency of light emission from said emitting layer.

17. An illumination system as in claim 16, wherein said light-transmitting solid further comprises an ultrafine powder, wherein said ultrafine powder has a particle size less than 300 nanometers, wherein said ultrafine powder is made from a material that has a bulk refractive index greater than 1.60 and wherein said ultrafine powder increases the effective refractive index of said light-transmitting solid.

18. An illumination system as in claim 17, wherein said material that has a bulk refractive index greater than 1.60 is selected from the group comprising tin oxide, titanium oxide, zinc oxide, cerium oxide and antimony pentoxide.

19. An illumination system as in claim 1, wherein said light-recycling envelope is constructed from a bulk material that is intrinsically reflective.

20. An illumination system as in claim 1, wherein the inside surfaces of said light-recycling envelope are covered with a reflective coating.

21. An illumination system as in claim 20, wherein said reflective coating is a diffuse reflector.

22. An illumination system as in claim 20, wherein said reflective coating is a specular reflector.

23. An illumination system as in claim 20, wherein said reflective coating is a diffuse reflector that is backed by a specular reflector.

24. An illumination system as in claim 1, wherein said reflectivity $R_E$ is at least 50%.

25. An illumination system as in claim 1, wherein said reflectivity $R_E$ is at least 70%.

26. An illumination system as in claim 1, wherein said reflectivity $R_E$ is at least 90%.

27. An illumination system as in claim 1, wherein said area $A_O$ is less than or equal to 50% of said area $A_S$.

28. An illumination system as in claim 1, wherein said area $A_O$ is less than or equal to 30% of said area $A_S$.

29. An illumination system as in claim 1, wherein said area $A_O$ is less than or equal to 10% of said area $A_S$.

30. An illumination system as in claim 1, wherein said area $A_O$ is less than 25 square millimeters.

31. An illumination system as in claim 1, wherein said area $A_O$ is less than 10 square millimeters.

32. An illumination system as in claim 1, wherein said illumination system further comprises a plurality of said light output apertures.

33. An illumination system as in claim 1, further comprising a planar reflective polarizer, wherein said planar reflective polarizer is located in the light output optical path, wherein said planar reflective polarizer is located adjacent to said at least one light output aperture of said light-recycling envelope, wherein said planar reflective polarizer reflects and recycles light of a first polarization state back into said light-recycling envelope and wherein said planar reflective polarizer transmits light of a second polarization state.

34. An illumination system as in claim 1, further comprising at least one light-collimating element, wherein said at least one light-collimating element has an input surface adjacent to said at least one light output aperture which accepts uncollimated light, wherein said at least one light-collimating element partially collimates said uncollimated light and wherein said at least one light-collimating element has an output surface through which the partially collimated light is transmitted.

35. An illumination system as in claim 34, wherein said at least one light-collimating element is chosen from the group comprising a convex lens, a tapered light guide and a compound parabolic reflector.

36. An illumination system as in claim 34, further comprising a beam-splitting prism polarizer, wherein said beam-splitting prism polarizer is located in the light output optical path adjacent to said output surface of said light-collimating element, wherein said beam-splitting prism polarizer has an input surface, a first output surface perpendicular to the input surface, a second output surface opposite the input surface and a partially reflecting diagonal surface, wherein light of a first polarization state transmitted through said output surface of said light-collimating element and entering said input surface of said beam-splitting prism polarizer is reflected by said partially reflecting diagonal surface and transmitted through said first output surface of said beam-splitting prism polarizer and wherein light of a second polarization state transmitted through said output surface of said light-collimating element and entering said input surface of said beam-splitting prism polarizer is transmitted through said second output surface of said beam-splitting prism polarizer.

37. An illumination system as in claim 36, further comprising a light reflector positioned adjacent and parallel to said first output surface of said beam-splitting prism polarizer, wherein said light of a first polarization state exiting said first output surface is reflected and recycled back through said first output surface, through said beam-splitting prism polarizer and through said light-collimating element into said light-recycling envelope.

38. An illumination system as in claim 36, further comprising a second light-collimating element and a second illumination system operating in combination, wherein said second illumination system comprises a second light-emitting diode surrounded by a second light-recycling envelope having a second light output aperture, wherein said second light-collimating element has an input surface and an output surface, wherein said input surface of said second light-collimating element is adjacent to said second light output aperture of said second illumination system, wherein said output surface of said second light-collimating element is adjacent to said first output surface of said beam-splitting prism polarizer and wherein said light of a first polarization state exiting said first output surface of said beam-splitting prism polarizer is transmitted backwards through said output surface of said second light-collimating element and is recycled through said second light-collimating element and into said second illumination system.